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Attorney Docket No. 0718.5/0477

TO: Assistant Commissioner for Patents
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Washington D.C. 20231

BROADENING REISSUE PATENT APPLICATION TRANSMITTAL

INVENTOR(S): Richard E. SKLAR, Lawrence E. GIRARD, Ralph P. Phillipp,
David C. Frankenbach, Dickey J. Berry, and Jim C. Williams

Original Patent Number: 5,790,175

Original Patent Issue Date (month/day/year): August 4, 1998

TITLE: AIRCRAFT SATELLITE TELEVISION SYSTEM FOR DISTRIBUTING
TELEVISION PROGRAMMING DERIVED FROM DIRECT BROADCAST
SATELLITES

Total Pages: 16

In connection with this application, the following are enclosed:

APPLICATION ELEMENTS:

- ☒ Specification, Claims, and Abstract (amended, if appropriate) - 13 pages
- ☒ Drawing(s) (proposed amendments, if appropriate) - 3 sheets, Figs. 1-5
- ☒ Reissue Oath/Declaration (original or copy) (37 CFR 1.175) (PTO/SB/51 or 52)) - 8 pages

Original U.S. Patent

- ☒ Offer to Surrender Original Patent (37 CFR 1.178) (PTO/SB/53 or PTO/SB/54) OR
- ☐ Ribbonded Original Patent Grant
- ☐ Affidavit/Declaration of Loss (PTO/SB/55)

Original U.S. Patent Current Assigned? ☒ YES ☐ NO

(if Yes, check applicable box(es))

- ☐ Written Consent of all Assignees (PTO/SB/53 or 54)
- ☒ Assent of Assignee
- ☒ 37 CFR 3.73(b) Statement
- ☐ Power of Attorney

ACCOMPANYING APPLICATION PARTS

- ☒ Transfer drawings from Patent File with attached 3 sheets of drawings
- ☐ Foreign Priority Claim (35 USC 119) - (if applicable)

002270-562250

- ☒ Information Disclosure Statement(IDS) with PTO-1449. ☒ Copies of IDS Citations (2)
☐ English Translation Document (if applicable)
☐ Preliminary Amendment
☒ Return Receipt Postcard (MPEP 503)
☐ Small Entity Statement(s)
☐ Statement filed in prior application, status still proper and desired.
☒ OTHER: Associate Power of Attorney and Change of Correspondence Address

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FEE CALCULATIONS: including Amendments to claims. (Small entity fees indicated in parentheses.)

(1) For	(2) Number Filed	(3) Number Extra	(4) Rate	(5) Basic Fee \$690 (\$345)
Total Claims	19	0	x \$18 (x \$9)	0.00
Independent Claims	6	3	x \$78 (x \$39)	\$234.00
TOTAL FEE:				\$924.00

METHOD OF PAYMENT:

☒ A check in the amount of the above TOTAL FEE is attached. This amount is believed to be correct; however, the Commissioner is hereby authorized to charge any additional fee or credit any overpayment to Deposit Account No. 19-0741.

☐ Payment by check is not enclosed. It is requested that the Patent and Trademark Office advise the undersigned of the period of time within which to file the TOTAL FEE.

Date: 7/27/2000

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Attorney Docket No. 071815/477

In re reissue patent application of

Richard E. SKLAR et al.

Serial No: Not yet assigned

Application for reissue of U.S. Patent No.
5,790,175, granted August 4, 1998

Filed: Herewith

For: **AIRCRAFT SATELLITE TELEVISION SYSTEM FOR DISTRIBUTING
TELEVISION PROGRAMMING DERIVED FROM DIRECT BROADCAST
SATELLITES**

ASSENT OF ASSIGNEE

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

The undersigned assignee of the entire right, title and interest to the United States Letters Patent 5,790,175 hereby assents to the accompanying reissue application and offers to surrender said Letters Patent.

Date: June 28, 2000

Name: L. A. Erickson

Title: Vice-President and Controller

Signature: _____

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Attorney Docket No. 071815/477

In re issuance patent application of

Richard E. SKLAR et al.

Serial No: Not yet assigned

Application for reissue of U.S. Patent No.
5,790,175, granted August 4, 1998

Filed: Herewith

For: AIRCRAFT SATELLITE TELEVISION SYSTEM FOR DISTRIBUTING
TELEVISION PROGRAMMING DERIVED FROM DIRECT BROADCAST
SATELLITES

CERTIFICATE UNDER 37 C.F.R. 3.73(b)

Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

Rockwell International Corporation, a corporation, certifies that it is the assignee of the entire right, title and interest in the patent application identified above by virtue of either:

A. ☐ An assignment from the inventor(s) of the patent application identified above. The assignment was recorded in the U.S. Patent and Trademark Office at Reel, Frame, or for which a copy thereof is attached.

OR

B. ☒ A chain of title from the inventor, of the patent application identified above, to the current assignee as shown below:

1. From: Richard E. Sklar, Lawrence E. Girard, Ralph P. Phillipp,
David C. Frankenbach, Dickie J. Berry, Jim C. Williams

2. From: Hughes Electronics

To: Rockwell International Corporation

☐ Additional documents in the chain of title are listed on a supplemental sheet.

☒ Copies of assignments or other documents in the chain of title are attached.

The undersigned has reviewed all the documents in the chain of title of the patent application identified above and, to the best of undersigned's knowledge and belief, title is in the assignee identified above.

The undersigned (whose title is supplied below) is empowered to sign this certificate on behalf of the assignee.

I hereby declare that all statements made herewith of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further, that these statements, and the like so made, are punishable by fine or imprisonment, or both, under Section 1001, Title 18 of United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: June 28, 2000

Name: L. A. Erickson

Title: Vice-President and Controller

Signature: 

**AIRCRAFT SATELLITE TELEVISION
SYSTEM FOR DISTRIBUTING TELEVISION
PROGRAMMING DERIVED FROM DIRECT
BROADCAST SATELLITES**

BACKGROUND

The present invention relates generally to in-flight aircraft entertainment systems, and more particularly, to satellite television systems that provide live in-flight television programming to passengers of an aircraft by way of direct broadcast satellite.

The assignee of the present invention manufactures in-flight aircraft entertainment systems, such as an APAX-150 digital passenger entertainment system, for example. The APAX-150 system, along with other commercially available systems, distributes audio and video material to passengers derived from a variety of sources. For example, existing aircraft passenger entertainment systems provide passengers with audio generated from audio tape players, movies derived from video tape players, and interactive services such as games, shopping and telecommunications. With the exception of telecommunication services (air-to-ground telephone calls, etc.), all existing services utilize on-board sources (tape players, etc.) to provide the viewable content.

According to polls of airline passengers, there is strong interest in live television programming as an entertainment option. This may include news, sporting events, movies and regular commercial programming. Up to now, each airplane has been a closed, self-contained content provider, in the sense that once off the ground, all entertainment is generated from within the aircraft. This has precluded the offering of live television. Now, with the advance in live broadcast satellite technology, it is possible to provide this desired service to the flying passenger.

An article was published by Jim C. Williams entitled "Airborne Satellite Television" published in the Fourth Quarter 1994 issue of Avion magazine at pages 43-54 that generally describes broadcasting of television programming to aircraft by way of satellites. Another article in that magazine entitled "MPEG The Great Enabler" describes MPEG compression technology which is used in the DirecTV digital broadcast satellite system to transmit multiple video and audio channels from a ground station to satellite transponders which relay them to ground-based receivers where they are decoded and displayed. These articles are incorporated herein by reference in their entirety.

The articles provide a description of the digital broadcast satellite system and its operation. The Airborne Satellite Television article also describes adapting the digital broadcast satellite system to provide live television broadcasts to aircraft. However, while a description is provided regarding a possible system that could be implemented and the problems that needed to be overcome to implement such a system were discussed, no details of an actual system were provided, such as system or component block diagrams, for example. In fact, the article states that a working system was to be developed in the future. The present invention is such a system.

Accordingly, it is an objective of the present invention to provide for satellite television systems that provide live in-flight television programming to aircraft passengers. It is a further objective of the present invention to provide for satellite television systems that provide live television programming to passengers that is derived from direct broadcast satellites.

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SUMMARY OF THE INVENTION

To meet the above and other objectives, the present invention is a satellite television system that provides live television programming to passengers by integrating direct broadcast satellite (DBS) services into currently available in-flight aircraft entertainment systems. The present invention combines direct broadcast satellite and audio and video entertainment technologies for the first time, to provide aircraft passengers with live in-flight television programming.

More specifically, the satellite television system comprises an antenna that is disposed on the aircraft and pointed at a plurality of satellites that are part of a direct broadcast satellite system. The antenna is controlled by an antenna controller and antenna interface unit that send control signals and process status signals to steer the antenna. The antenna is steered so that it is locked onto RF signals transmitted by the satellite. The antenna interface unit down-converts the received RF signals to provide left hand circularly polarized RF signals and right hand circularly polarized RF signals that contain different sets of television channels.

The downconverted RF signals are decoded by a receiver/decoder to provide video signals corresponding to a plurality of television channels. The video signals for the plurality of channels are routed to a video and audio distribution system on the aircraft which distributes live television programming to the passengers. A low-cost single receiver/decoder version of the system is also disclosed that provides a single channel of video and audio television programming to overhead monitors in an aircraft.

The present invention may be implemented with any in-flight distributed video system, whether it is interactive or not. It is equally applicable to systems where video is shown on overhead monitors wherein each passenger views the same program, and to systems where each passenger has an individual in-seat video monitor and can select from a number of available programs.

BRIEF DESCRIPTION OF THE DRAWINGS

The various features and advantages of the present invention may be more readily understood with reference to the following detailed description taken in conjunction with the accompanying drawings, wherein like reference numerals designate like structural elements, and in which:

FIG. 1 is a top level block diagram of a first embodiment of a satellite television system in accordance with the principles of the present invention that provides live inflight television programming for aircraft passengers;

FIG. 2 is a block diagram of an antenna interface unit employed in the system of FIG. 1;

FIG. 3 is a block diagram of an antenna controller employed in the system of FIG. 1;

FIG. 4 is a block diagram of a receiver/decoder employed in the system of FIG. 1; and

FIG. 5 is a block diagram of a second embodiment of a satellite television system in accordance with the principles of the present invention.

DETAILED DESCRIPTION

Referring to the drawing figures, FIG. 1 shows a top level block diagram of a first embodiment of a satellite television system 10 in accordance with the principles of the present invention. The satellite television system 10 provides live television programming for passengers in an aircraft. The

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satellite television system 10 comprises an antenna 11 that is disposed adjacent the surface of the aircraft. The antenna 11 is pointed at satellites 18, such as DirecTV satellite 18, for example, that are part of the existing DirecTV direct broadcast satellite (DBS) system. The antenna 11 is steered so that it is locked onto the RF signal transmitted by the satellite 18. The antenna 11 is controlled by an antenna controller 17 that sends control signals and processes status signals to and from the antenna 11 by way of an antenna interface unit 12. However, it is to be understood that the antenna 11 may be an electronically steered antenna 11 or a mechanically steered antenna 11.

The antenna interface unit 12 downconverts the received RF signals to provide left hand circularly polarized RF signals and right hand circularly polarized RF signals that contain different sets of television channels. The received RF signals are in the 12.2–12.7 GHz band which are downconverted to IF signals in the 950–1450 MHz band. The downconverted IF signals are processed by a receiver/decoder 13 which decodes them to provide video signals corresponding to a plurality of television channels. The video signals for the various channels are then routed to a conventional video and audio distribution system 14 on the aircraft which distributes live television programming to the passengers. The receiver/decoder 13 may generate either baseband video and analog audio, or digitally compressed video and audio depending on the nature of the distribution system 14.

Referring to FIG. 2, it shows a block diagram of one embodiment of the antenna interface unit 12 employed in the system of FIG. 1. The antenna interface unit 12 comprises a downconverter 21 that downconverts the RF signals from the 12.2–12.7 GHz band to the 950–1450 MHz band which are output to the receiver/decoder 13. A servo controller 22 is coupled between the antenna controller 17 and the antenna 11. The servo controller 22 processes antenna position signals to generate elevation motor drive signals that are supplied to the antenna 11. The servo controller 22 also outputs azimuth control signals to a servo power amplifier 23 that generates azimuth motor drive signals that are supplied to the antenna 11. Motor position signals are fed from the antenna 11 to the servo power amplifier 23. Power is supplied to the antenna 11 by the servo power amplifier 23. A power supply 24 is provided that converts 115 volt AC power into appropriate DC voltages for the downconverter 21, the servo controller 22 and the servo power amplifier 23.

Referring to FIG. 3, it shows a block diagram of the antenna controller 17 employed in the system 10 of FIG. 1. The antenna controller 17 comprises a controller 31 that is coupled to an RS485 interface 33 and an ARINC 429 interface 34. A power supply 35 is provided that converts 115 volt AC power into appropriate DC voltages for the controller 31, the RS485 interface 33, and the ARINC 429 interface 34. The controller 31 may be an Intel 486 processor, for example. The RS485 interface 33 is coupled between the antenna interface unit 12 and the controller 31 and couples control and status signals thereto. The ARINC 429 interface 34 is coupled between the aircraft navigation system 15 or global positioning system (GPS) 16 and the controller 31 and couples inertial reference signals thereto which is used to accurately steer the antenna 11 toward the satellite 18.

Referring to FIG. 4, it shows a block diagram of the receiver/decoder 13 employed in the system of FIG. 1. The receiver/decoder 13 comprises a passive mother board 41 which has PCI and ISA busses 46a, 46b. A DSS PC card 42, for example, available from Hughes Network Systems and

a computer processor 43 are coupled to the PCI bus 46a. The DSS PC card 42 and the computer processor 43 contain electronics and software that are substantially identical to a receiver/decoder that is used in commercially available DSS systems, such as those made by RCA, for example. Thus, the DSS PC card 42 and the computer processor 43 perform the functions of the receiver/decoder 13.

The computer processor 43 may be coupled to a rotary switch 46, for example, that is used to select a channel for viewing. The computer processor 43 also has a serial test port 47 that may be used to test the processor 43 and DSS PC card 42. A flash disk card 44 is coupled to the ISA bus 46b and is used to store data and code in a manner similar to a hard disk. A power supply 45 is coupled to the passive mother board 41 and is used to convert 115 volt AC power into appropriate DC voltages for the DSS PC card 42, the computer processor 43, and the flash disk card 44.

In operation, the antenna 11 is appropriately steered to lock onto the satellites 18, and television signals are received on the aircraft for distribution to its passengers. The antenna 11 tracks the satellites 18 using the antenna controller 17, the antenna interface unit 12 and servo motors on the antenna 11. The antenna 11 tracks the satellites 18 by means of electronic or mechanical steering (or a combination of both), and in both azimuth and elevation directions. To accomplish this, the system 10 uses information regarding the location of the satellites 18 and the location and attitude of the aircraft. This information is provided by the aircraft navigation system 15 or via a navigational system 16 such as the GPS receiver 16. The antenna interface unit 12 provides control signals to the steering circuits within the antenna 11, whether electronic or mechanical. The antenna controller 17 commands the antenna interface unit 12 where to point the antenna 11 based on the location and attitude of the aircraft. In the disclosed embodiment, steering control is partitioned to use the antenna controller 17 and the antenna interface unit 12, but in other embodiments, a single controller 17 may be used.

Once the antenna 11 is pointed at the satellites 18, its RF output signal (approximately 12 GHz) is downconverted to approximately 1 GHz in the antenna interface unit 12. This signal is applied to the receiver/decoder 13 where it is appropriately processed and made available to the video and audio distribution system 14. The nature of the video and audio distribution system 14 in the aircraft determines the format of the output of the receiver/decoder 13, which may be analog or digital, and if it is digital, whether it is encoded or decoded.

Referring now to FIG. 5, it shows a block diagram of a second embodiment of a satellite television system 10a in accordance with the principles of the present invention. The system 10a of FIG. 5 provides for low-cost distribution of live television programming to overhead monitors 19 in an aircraft. This embodiment specifically addresses ease of distribution of live television programming within an aircraft where the programming is viewed on overhead monitors 19 mounted throughout the aircraft. In this case, a single television program is viewed by all passengers at the same time. Consequently, this system 10a provides for a low-cost solution to the general distribution case described with reference to the system 10 of FIG. 1.

The system 10a is suitable for aircraft that show video material on overhead monitors 19 mounted throughout the aircraft. Current systems of this type use the overhead monitors 19 to display movies from an on-board video tape player 25. Audio is distributed to each passenger's head-

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phones 20. The system 10a of FIG. 5 provides for low-cost distribution of a single live television program, thus allowing an airline to add this feature without installing a costly upgraded distribution system 14. This embodiment may be implemented in any in-flight distribution system 14 where a single program is presented on overhead monitors 19 mounted throughout the aircraft.

In the embodiment of FIG. 5, the receiver/decoder 13 outputs a single channel of live television which comprises one video output and one audio output. The receiver/decoder 13 receives the RF signal from the antenna interface unit 12, extracts the desired channel, decodes this data and generates baseband video and analog audio output signals. The decoding process that is employed depends upon the type of encoding that is used at the ground-based program source, which may be MPEG compression, for example.

Only a single-channel receiver/decoder 13 is required, since in this low-cost application, only one television program is shown at a time. The receiver/decoder 13 used in the system 10a disclosed with reference to FIG. 4 employs a rotary switch or other means to select one television channel. The baseband video and analog audio output signals from the receiver/decoder 13 are in the same format as those of the video tape player 25, for example, so that it is entirely compatible with the existing distribution system 14. Therefore, the satellite television system 10a can coexist with other video and audio sources on the aircraft, such as video and audio tape players, for example. The flight crew selects one of the video and audio sources since only one source can be displayed on the overhead monitors 19 at a given time.

Thus, satellite television systems that provide live television programming to passengers that is derived from direct broadcast satellites have been disclosed. It is to be understood that the described embodiments are merely illustrative of some of the many specific embodiments which represent applications of the principles of the present invention. Clearly, numerous and varied other arrangements may be readily devised by those skilled in the art without departing from the scope of the invention.

What is claimed is:

1. A satellite television system that provides live television programming to passengers on an aircraft derived from direct broadcast satellites, said system comprising:

a video and audio distribution system disposed on the aircraft for distributing video signals to the passengers on the aircraft;

an antenna that comprises steering means for steering the antenna toward the satellite in response to control signals supplied thereto;

antenna control means for providing the control signals to the antenna and for processing status signals derived from the antenna to steer the antenna so that it is locked onto RF signals transmitted by the satellite, and for downconverting the RF signals to provide left hand and right hand circularly polarized RF signals that correspond to a plurality of television channels; and

a receiver/decoder coupled to the antenna control means for processing the downconverted RF signals to provide video signals corresponding to the plurality of television channels, and for feeding back the status signals to the antenna control means which are used to steer the antenna to lock it onto the RF signals received from the satellite, and for outputting the video signals to the video and audio distribution system which distributes live television programming to the passengers.

2. The system of claim 1 wherein the antenna control means comprises:

- an antenna controller coupled to the receiver/decoder for processing status signals derived therefrom; and
- an antenna interface unit coupled between the antenna and the receiver/decoder for downconverting the RF signals to provide the left hand and right hand circularly polarized RF signals that contain different sets of television channels, and coupled between the antenna controller and the antenna for coupling the control and status signals therebetween.

3. The system of claim 2 wherein the antenna controller comprises:

- a controller;
- an RS485 interface coupled between the controller and the antenna interface unit for coupling the control and status signals to the controller; and
- an ARINC 429 interface coupled between the controller and a navigation system for coupling inertial reference signals provided by the navigation system to the controller which are used to generate steering signals that steer the antenna toward the satellite.

4. The system of claim 2 wherein the antenna interface unit comprises:

- a downconverter for downconverting the RF signals received from the antenna and for outputting the downconverted RF signals to the receiver/decoder;
- a servo controller coupled between the RS485 interface of the antenna controller and the antenna for processing antenna position signals to generate elevation motor drive signals that are supplied to the antenna, and for outputting azimuth control signals;
- a servo power amplifier coupled between the servo controller and the antenna for supplying power to the antenna, and for processing motor position control signals derived from the antenna and the azimuth control signals derived from the servo controller to generate azimuth motor drive signals that are supplied to the antenna.

5. The system of claim 1 wherein the receiver/decoder comprises:

- a passive mother board having first and second computer busses;
- a receiver/decoder card coupled to the first computer bus;
- a computer processor coupled to the first computer bus;
- a rotary switch coupled to the computer processor for selecting channels for viewing; and
- a flash disk card coupled to the second bus for storing video, audio and control signals.

6. A satellite television system that provides a single channel of live television programming to overhead monitors mounted throughout an aircraft derived from direct broadcast satellites, said system comprising:

- a video and audio distribution system disposed on the aircraft for distributing video signals to the passengers on the aircraft on overhead monitors mounted throughout the aircraft;
- an antenna that is disposed adjacent a surface of the aircraft and that comprises steering means for steering the antenna toward the satellite in response to control signals supplied thereto;

antenna control means for providing the control signals to the antenna and for processing status signals derived from the antenna to steer the antenna so that it is locked

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onto RF signals transmitted by the satellite, and for downconverting the RF signals to provide left hand and right hand circularly polarized RF signals that correspond to a plurality of television channels; and

- a receiver/decoder coupled to the antenna control means for processing the downconverted RF signals to provide video signals corresponding to the plurality of television channels, and for feeding back the status signals to the antenna control means which are used to steer the antenna to lock it onto the RF signals received from the satellite, and for outputting the video signals corresponding to a single television channel to the video and audio distribution system which distributes live television programming corresponding to the single television channel to the overhead monitors mounted throughout the aircraft.

7. The system of claim 6 wherein the antenna control means comprises:

- an antenna controller coupled to the receiver/decoder for processing status signals derived therefrom; and
- an antenna interface unit coupled between the antenna and the receiver decoder for downconverting the RF signals to provide the left hand and right hand circularly polarized RF signals that contain different sets of television channels, and coupled between the antenna controller and the antenna for coupling the control and status signals therebetween.

8. The system of claim 7 wherein the antenna controller comprises: a controller;

- an RS485 interface coupled between the controller and the antenna interface unit for coupling the control and status signals to the controller; and
- an ARINC 429 interface coupled between the controller and a navigation system for coupling inertial reference signals provided by the navigation system to the controller which are used to generate steering signals that steer the antenna toward the satellite.

9. The system of claim 8 wherein the antenna interface unit comprises:

- a downconverter for downconverting the RF signals received from the antenna and for outputting the downconverted RF signals to the receiver/decoder;
- a servo controller coupled between the RS485 interface of the antenna controller and the antenna for processing antenna position signals to generate elevation motor drive signals that are supplied to the antenna, and for outputting azimuth control signals;
- a servo power amplifier coupled between the servo controller and the antenna for supplying power to the antenna, and for processing motor position control signals derived from the antenna and the azimuth control signals derived from the servo controller to generate azimuth motor drive signals that are supplied to the antenna.

10. The system of claim 6 wherein the receiver/decoder comprises:

- a passive mother board having first and second computer buses;
- a receiver/decoder card coupled to the first computer bus that decodes video signals corresponding to the single television channel;
- a computer processor coupled to the first computer bus; and
- a flash disk card coupled to the second bus for storing video, audio and control signals.

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11. A satellite television system that provides live television programming to passengers on an aircraft derived from direct broadcast satellites, said system comprising:

a video and audio distribution system disposed on the aircraft for distributing video signals to the passengers on the aircraft;

an antenna that comprises steering means for steering the antenna toward the satellite in response to control signals supplied thereto;

antenna control means comprising:

an antenna interface unit coupled to the antenna for downconverting RF signals to provide left hand and right hand circularly polarized RF signals that contain different sets of television channels; and

an antenna controller comprising a controller, an RS485 interface coupled between the controller and the antenna interface unit for coupling control signals to the antenna and for processing status signals derived from the antenna to steer the antenna so that it is locked onto RF signals transmitted by the satellite, and an ARINC 429 interface coupled between the controller and a navigation system for coupling inertial reference signals provided by the navigation system to the controller which are used to generate steering signals that steer the antenna toward the satellite; and

a receiver/decoder coupled to the antenna interface unit for processing the downconverted RF signals to provide video signals corresponding to the plurality of television channels, and for feeding back the status signals to the antenna controller which are used to steer the antenna to lock it onto the RF signals received from the satellite, and for outputting the video signals to the video and audio distribution system which distributes live television programming to the passengers.

12. The system of claim 11 wherein the antenna interface unit comprises:

a downconverter for downconverting the RF signals received from the antenna and for outputting the downconverted RF signals to the receiver/decoder;

a servo controller coupled between the RS485 interface of the antenna controller and the antenna for processing antenna position signals to generate elevation motor drive signals that are supplied to the antenna, and for outputting azimuth control signals;

a servo power amplifier coupled between the servo controller and the antenna for supplying power to the antenna, and for processing motor position control signals derived from the antenna and the azimuth control signals derived from the servo controller to generate azimuth motor drive signals that are supplied to the antenna.

13. A satellite television system that provides a single channel of live television programming to overhead monitors mounted throughout an aircraft derived from direct broadcast satellites, said system comprising:

a video and audio distribution system disposed on the aircraft for distributing video signals to the passengers on the aircraft on overhead monitors mounted throughout the aircraft;

an antenna that is disposed adjacent a surface of the aircraft and that comprises steering means for steering the antenna toward the satellite in response to control signals supplied thereto;

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antenna control means comprising:

an antenna interface unit coupled to the antenna for downconverting RF signals to provide left hand and right hand circularly polarized RF signals that contain different sets of television channels; and

an antenna controller comprising a controller, an RS485 interface coupled between the controller and the antenna interface unit for coupling control signals to the antenna and for processing status signals derived from the antenna to steer the antenna so that it is locked onto RF signals transmitted by the satellite, and an ARINC 429 interface coupled between the controller and a navigation system for coupling inertial reference signals provided by the navigation system to the controller which are used to generate steering signals that steer the antenna toward the satellite; and

a receiver/decoder coupled to the antenna interface unit for processing the downconverted RF signals to provide video signals corresponding to the plurality of television channels, and for feeding back the status signals to the antenna controller which are used to steer the antenna to lock it onto the RF signals received from the satellite, and for outputting the video signals corresponding to a single television

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channel to the video and audio distribution system which distributes live television programming corresponding to the single television channel to the overhead monitors mounted throughout the aircraft.

14. The system of claim 13 wherein the antenna interface unit comprises:

- a downconverter for downconverting the RF signals received from the antenna and for outputting the down-converted RF signals to the receiver/decoder;
- a servo controller coupled between the RS485 interface of the antenna controller and the antenna for processing antenna position signals to generate elevation motor drive signals that are supplied to the antenna, and for outputting azimuth control signals;
- a servo power amplifier coupled between the servo controller and the antenna for supplying power to the antenna, and for processing motor position control signals derived from the antenna and the azimuth control signals derived from the servo controller to generate azimuth motor drive signals that are supplied to the antenna.

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--15. A satellite television system that provides television programming in real time to passengers on an aircraft derived from at least one satellite, said system comprising:

a video and audio signal distribution system disposed on the aircraft, the video and audio signal distribution system being configured to distribute video and audio signals to the passengers on the aircraft;

a steerable antenna that is capable of being steered towards the at least one satellite in response to control signals supplied thereto;

an antenna controller that is coupled to the steerable antenna, the antenna controller being configured to provide the control signals to the steerable antenna, to steer the steerable antenna so that the steerable antenna is locked onto RF signals transmitted by the at least one satellite, and to downconvert the RF signals to provide downconverted RF signals that correspond to a plurality of programming channels; and

a receiver/decoder that is coupled to the antenna controller and to the video and audio signal distribution system, the antenna controller being configured to process the downconverted RF signals to provide video and audio signals corresponding to the plurality of programming channels, and to output the video and audio signals to the video and audio signal distribution system which distributes the plurality of programming channels in real time to the passengers.

16. The system of claim 15, wherein the downconverted RF signals correspond to left hand and right hand circularly polarized downconverted RF signals.

17. The system of claim 15, wherein the video and audio signal distribution system distributes video and audio television signals to the passengers.

18. The system of claim 15, wherein the antenna controller processes status signals derived from the steerable antenna to steer the steerable antenna.

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19. A satellite television system that provides television programming in real time to passengers on an aircraft derived from at least one satellite, said system comprising:

a video and audio signal distribution system disposed on the aircraft, the video and audio signal distribution system being configured to distribute video and audio signals to the passengers on the aircraft;

a steerable antenna that is capable of being steered towards the at least one satellite in response to control signals supplied thereto;

an antenna controller that is coupled to the steerable antenna, the antenna controller being configured to provide the control signals to the steerable antenna, to steer the steerable antenna so that the steerable antenna is locked onto RF signals transmitted by the at least one satellite;

a downconverter that is coupled to the antenna controller and that downconverts the RF signals to provide downconverted RF signals that correspond to a plurality of programming channels; and

a receiver/decoder that is coupled to the downconverter and to the video and audio signal distribution system, the receiver/decoder being configured to process the downconverted RF signals to provide video and audio signals corresponding to the plurality of programming channels, and to output the video and audio signals to the video and audio signal distribution system which distributes the plurality of programming channels in real time to the passengers.--

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ABSTRACT

A system that provides live television programming to passengers by integrating direct broadcast satellite services into an in-flight aircraft entertainment system. The present invention is a satellite television system that has an antenna disposed on the aircraft that is pointed at a plurality of satellites that are part of a direct broadcast satellite system. The antenna is controlled by an antenna controller and antenna interface unit that send control signals and process status signals to steer the antenna. The antenna is steered to lock it onto RF signals transmitted by the satellites. The antenna interface unit downconverts the received RF signals to provide left hand circularly polarized RF signals and right hand circularly polarized RF signals that contain different sets of television channels. The downconverted RF signals are processed by a receiver/decoder that decodes them to provide video signals corresponding to different television channels. The video signals for the different channels are routed to a video and audio distribution system on the aircraft which distributes live television programming to the passengers. A low-cost single channel receiver/decoder version of the system is also disclosed that provides a single channel of television programming to overhead monitors in an aircraft.

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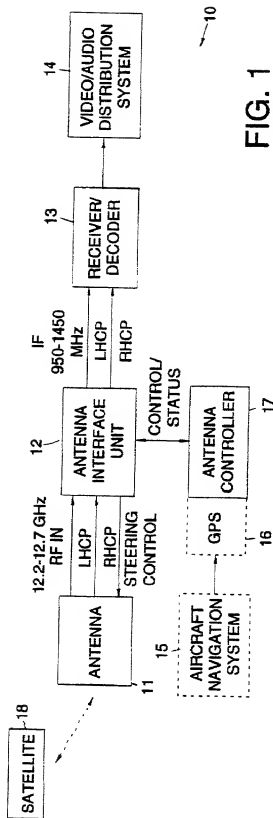


FIG. 1

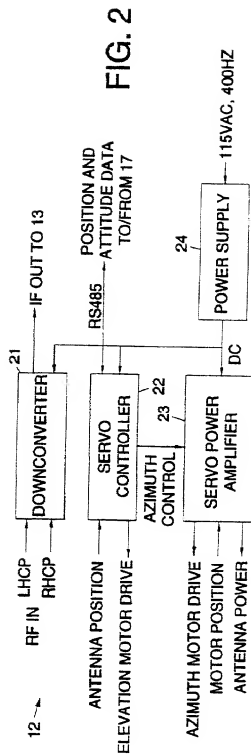


FIG. 2

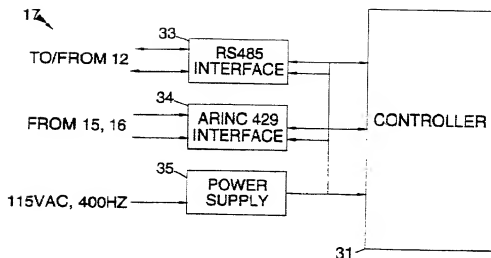


FIG. 3

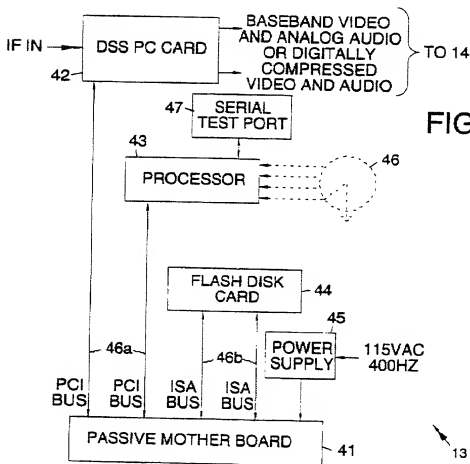
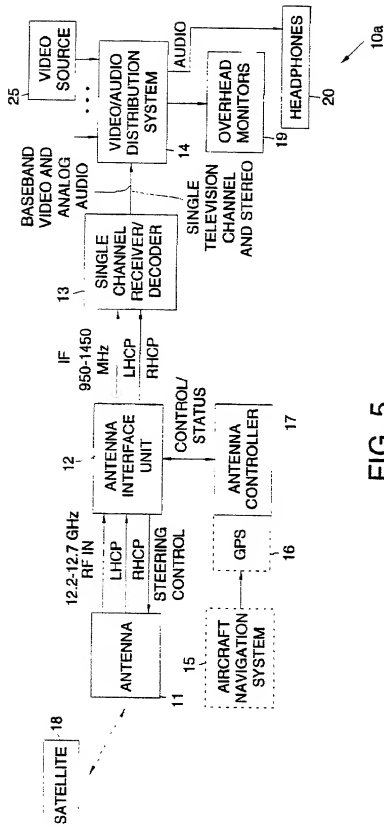
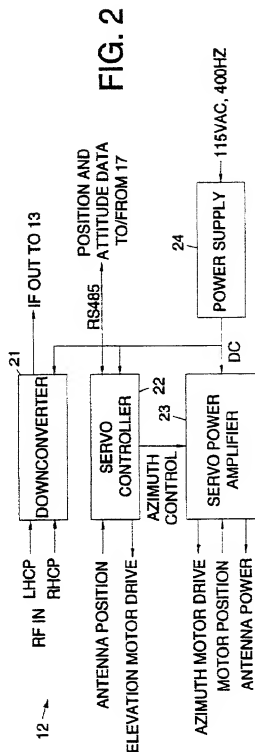
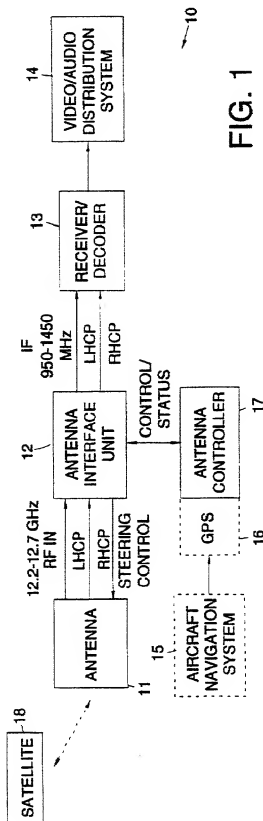


FIG. 4





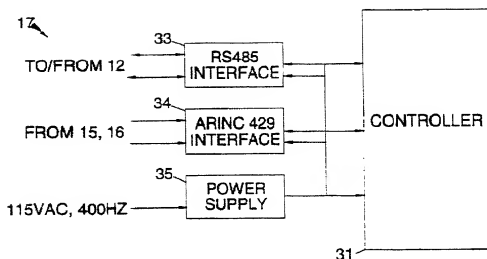


FIG. 3

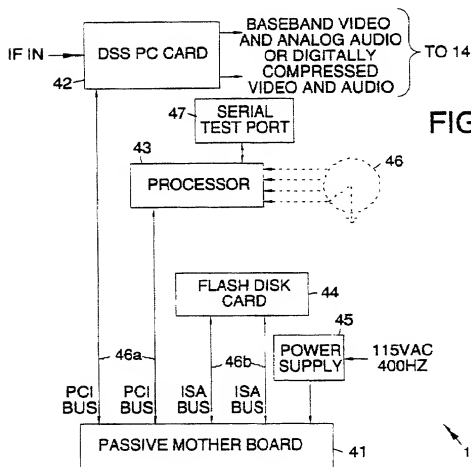
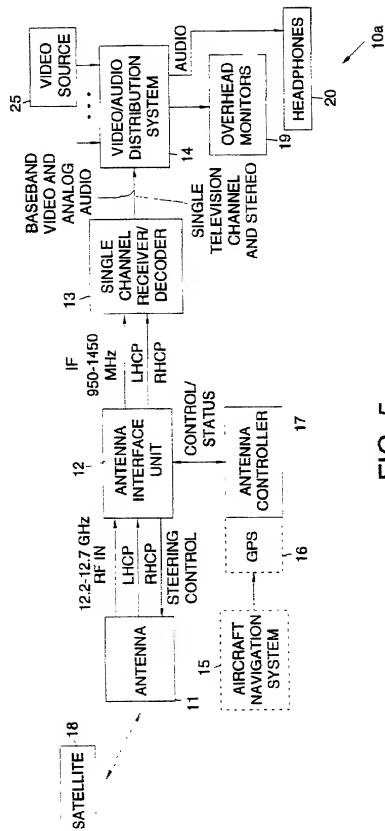


FIG. 4



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Attorney Docket No.: 071815/0477

In re patent application of:

Richard E. SKLAR et al.

Serial No.: Not yet assigned

Application for reissue of U.S.

Patent No. 5,790,175,
granted August 4, 1998

Filed: Herewith

For: **AIRCRAFT SATELLITE TELEVISION SYSTEM FOR DISTRIBUTING
TELEVISION PROGRAMMING DERIVED FROM DIRECT BROADCAST
SATELLITES**

**ASSOCIATE POWER OF ATTORNEY AND CHANGE OF
CORRESPONDENCE ADDRESS**

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

The undersigned officer of Rockwell International Corporation hereby grants the following attorneys/agents associate power to prosecute the above-identified application and transact all business in the Patent and Trademark Office connected therewith:

Johnny A. Kumar, Reg. No. 34,649; Phillip J. Articola, Reg. No. 38,819; Joseph N. Ziebert, 35,421; other members of the law firm of Foley and Lardner; and Kyle Eppele, Reg. No. 34,155, of Rockwell International Corporation.

It is requested that all future correspondence be mailed to:

Kyle Epple
Rockwell International Corporation
Intellectual Property Division
400 Collins Road NE, M/S/ 124/323
Cedar Rapids, Iowa 52498

Respectfully submitted,

Date: June 28, 2000

Name: L. A. Erickson

Title: Vice-President and Controller

Signature: _____

A handwritten signature in black ink, appearing to be 'L. A. Erickson', is written over a horizontal line. The signature is stylized with a large loop at the beginning and a long, sweeping tail.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Attorney Docket No. 071815/477

In re issuance patent application of

Richard E. SKLAR et al.

Serial No: Not yet assigned

Application for reissue of U.S. Patent No.
5,790,175, granted August 4, 1998

Filed: Herewith

For: AIRCRAFT SATELLITE TELEVISION SYSTEM FOR DISTRIBUTING
TELEVISION PROGRAMMING DERIVED FROM DIRECT BROADCAST
SATELLITES

BROADENING REISSUE DECLARATION
UNDER 37 C.F.R. §1.175

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

We, Richard Sklar, Lawrence Girard, Ralph Phillipp, David Frankenbach, Dickey Berry, and Jim Williams declare that:

1. Our residence, post office address and citizenship are stated below next to our names.
2. We believe we are the original and first inventors of the subject matter described and claimed in our U.S. Patent 5,790,175 and in the foregoing specification for which a reissue patent is sought on the invention entitled AIRCRAFT SATELLITE TELEVISION SYSTEM FOR DISTRIBUTING TELEVISION PROGRAMMING DERIVED FROM DIRECT BROADCAST SATELLITES.

3. We have reviewed and understand the contents of the above-identified specification, including the claims.

4. We acknowledge the duty to disclose information which is material to examination of the application in accordance with 37 C.F.R. §1.56(a).

5. There are no foreign applications or inventors certificates having a filing date before that of the applications on which priority is claimed.

6. We believe U.S. Patent No. 5,790,175 ("the '175 patent") is wholly or partly inoperative or invalid by reason of our claiming less than we had the right to claim in the patent.

7. One specific error was for us not to include claims which recite:

(Reissue claim 15) A satellite television system that provides television programming in real time to passengers on an aircraft derived from at least one satellite, said system comprising:

a video and audio signal distribution system disposed on the aircraft, the video and audio signal distribution system being configured to distribute video and audio signals to the passengers on the aircraft;

a steerable antenna that is capable of being steered towards the at least one satellite in response to control signals supplied thereto;

an antenna controller that is coupled to the steerable antenna, the antenna controller being configured to provide the control signals to the steerable antenna, to steer the steerable antenna so that the steerable antenna is locked onto RF signals transmitted by the at least one satellite, and to downconvert the RF signals to provide downconverted RF signals that correspond to a plurality of programming channels; and

a receiver/decoder that is coupled to the antenna controller and to the video and audio signal distribution system, the antenna controller being configured to process the downconverted RF signals to provide video and audio signals corresponding to the plurality of programming channels, and to output the video and audio signals to the video and audio signal distribution system which distributes the plurality of programming channels in real time to the passengers.

(Reissue claim 16) The system of claim 15, wherein the downconverted RF signals correspond to left hand and right hand circularly polarized downconverted RF signals.

(Reissue claim 17) The system of claim 15, wherein the video and audio signal distribution system distributes video and audio television signals to the passengers.

(Reissue claim 18) The system of claim 15, wherein the antenna controller processes status signals derived from the steerable antenna to steer the steerable antenna.

(Reissue claim 19) A satellite television system that provides television programming in real time to passengers on an aircraft derived from at least one satellite, said system comprising:

a video and audio signal distribution system disposed on the aircraft, the video and audio signal distribution system being configured to distribute video and audio signals to the passengers on the aircraft;

a steerable antenna that is capable of being steered towards the at least one satellite in response to control signals supplied thereto;

an antenna controller that is coupled to the steerable antenna, the antenna controller being configured to provide the control signals to the steerable antenna, to steer the steerable antenna so that the steerable antenna is locked onto RF signals transmitted by the at least one satellite;

a downconverter that is coupled to the antenna controller and that downconverts the RF signals to provide downconverted RF signals that correspond to a plurality of programming channels; and

a receiver/decoder that is coupled to the downconverter and to the video and audio signal distribution system, the antenna controller being configured to process the

downconverted RF signals to provide video and audio signals corresponding to the plurality of programming channels, and to output the video and audio signals to the video and audio signal distribution system which distributes the plurality of programming channels in real time to the passengers.

8. By this reissue declaration, we desire to seek broadened claims, and, this application for reissue of the original Letters Patent addresses the aforementioned error by including new independent claim 15 which does not recite an unnecessary feature of providing antenna steering by way of feeding back status signals using a receiver/decoder and an unnecessary feature of the status signals for steering the antenna, by adding new dependent claims 16-18 to define the system of the present invention with the variety in scope and the degree of specificity necessary to adequately protect the invention, and by adding new independent claim 19 which does not recite an unnecessary feature of providing antenna steering by way of feeding back status signals using a receiver/decoder. Support for the new claims exist in Figure 1 of the Letters Patent and the accompanying description of that figure in the specification.

9. We believe that the errors recited above and being presented for correction in this reissue application arose without any deceptive intention on our part.

WHEREFORE, We pray that we may be allowed to surrender the original Letters Patent 5,722,500 and do hereby offer same.

We hereby appoint Stephen A. Bent, Reg. No. 29,768; David A. Blumenthal, Reg. No. 26,257; William T. Ellis, Reg. No. 26,874; John J. Feldhaus, Reg. No. 28,822; Patricia D. Granados, Reg. No. 33,683; John P. Isacson, Reg. No. 33,715; Peter G. Mack, Reg. No. 26,001; Brian J. McNamara, Reg. No. 32,789; Sybil Meloy, Reg. No. 22,749; George E. Quillin, Reg. No. 32,792; Colin G. Sandercock, Reg. No. 31,298; Bernhard D. Saxe, Reg. No. 28,665; Charles F. Schill, Reg. No. 27,590; Richard L. Schwaab, Reg. No. 25,479; Harold C. Wegner, Reg. No. 25,258, Johnny A. Kumar, Reg. No. 34,649, Phillip J. Articola, Reg. No. 38,819, Joseph N. Ziebert, Reg. No. 35,421, and Kyle Eppele, Reg. No. 34,155, as our attorneys with full power of substitution and revocation to prosecute this application and to transact all business in the U.S. Patent and Trademark Office connected herewith, and request that all correspondence be sent to FOLEY & LARDNER, 3000 K Street, N.W., Suite 500, Washington, DC 20007-5109 at (202) 672-5300.

The undersigned petitioners declare further that all statements made herein of their own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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David C. Frankenbach

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Dickey J. Berry

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LA VERNE CA

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USA

91750

Jim C. Williams

Signature: _____

Date: _____

Residence: _____

Post Office Address: _____

Citizenship: _____

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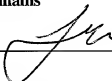
Dickey J. Berry


Signature: _____ Date: _____

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Jim C. Williams

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